This document contains the Comprehensive Conservation and Management Plan for Narragansett Bay, December 1992: Abstract, Dedication, State Planning Council, Technical Committee, Policy Statement on Implementation, Preface, Table of Contents and Executive Summary.

The report (narragansett_ccmp_pt1.pdf) can be downloaded from:

http://www.epa.gov/owow/estuaries/ccmp/documents/narragansettbay.html

File 1 of 7

December 1992

Jessica Cogan

ABSTRACT

TITLE:	Comprehensive Conservation and Management Plan for Narragansett Bay
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ABSTRACT: This document sets forth goals and implementation strategies to improve and sustain the health of Narragansett Bay. It is the culmination of six years of research and review of the issues by scientists, planners, interest groups, and legal experts, an endeavor funded by the U.S. Environmental Protection Agency and overseen by an Executive Committee of directors of Environmental Management, the Coastal Resources Management Council, the R.I. Division of Planning, and the Water Quality Branch of USEPA Region I.

The Plan has six distinct but interrelated parts: an Introduction, establishing the need for the Plan, the history of the Narragansett Bay Project, and the process of Plan development; Background, describing "the state of the Bay"; Goals; Issues, Objectives, and Strategies; information on Plan Implementation, including unfinished agenda; and Summary Matrices. These are followed by an extensive Bibliography and Appendices.

DEDICATION

"If we have seen further, it is by
standing upon the shoulders of giants."

Paraphrased fr. Sir Isaac Newton

The first edition of the Narragansett Bay *Comprehensive Conservation and Management Plan* (1992) is dedicated to Senator John Chafee, Mr. Robert L. Bendick, Jr., Ms. Gertrude "Trudy" Coxe and Mr. Michael Deland who were instrumental in founding the Narragansett Bay Project. These individuals should be credited for recognizing that the nation's inheritance in its coastal waters ultimately depends upon the nation's ability to comprehend the relationship between estuaries and the land, and the durability of the public - private partnership to steward the use of coastal resources for the next generation.

The staff of the Narragansett Bay Project also extends its deepest appreciation and thanks to Mr. Daniel W. Varin, Ms. Louise Durfee, Mr. Malcolm J. Grant and Mr. James W. Fester for their counsel and perseverance; the staffs of the Rhode Island Department of Environmental Management, the Rhode Island Coastal Resources Management Council, and the Rhode Island Division of Planning, who labored on the Narragansett Bay Plan knowing they were to be its custodians; the Project's Committees for keeping their eyes on the prize; friends and supporters of the planning process; and the generations of citizens that must now take the lead in protecting Narragansett Bay.

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AND
PROVIDENCE PLANTATIONS
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STATE PLANNING COUNCIL
Policy Statement on Implementation of the Comprehensive Conservation and Management Plan for Narragansett Bay

The state recognizes the need for all levels of government and the private sector to cooperate in implementing the recommendations of this plan. The benefits of a clean Bay are important to federal, state, and local governments alike. Each level has a role in striving toward the goals of the plan. It is important to recognize that many recommendations are already required by state or federal law, such as the Clean Water Act. In such cases, the state is limited in its ability to reassign responsibility for recommended actions.

Local role

Local governments are properly assigned to carry out many recommendations of the plan. However, in plan implementation decisions, the state shall not assign responsibilities disproportionately to local governments, who are least able in terms of financial and other resources to support new efforts. The state shall provide cities and towns with financial and technical assistance, where possible, to implement recommendations of the plan and shall attempt to secure assistance from federal agencies also, where appropriate. No city or town shall be held solely responsible for accomplishing recommendations, in the absence of equitably proportioned federal or state assistance, if these actions are not otherwise required by federal or state law and would impose a severe and unreasonable burden as determined by state officials. In determining consistency of a local comprehensive plan with the State Guide Plan, the state shall recognize that goals represent ideals rather than immediately achievable objectives, and shall take into account the reasonableness of expecting local governments to implement State Guide Plan recommendations. The state shall recognize the different scale and responsibilities of local government; limitations on their authority, capacity, and ability to pay; and competing demands for resources. Local plans shall be found inconsistent with the State Guide Plan only where they:

- directly conflict with goals, policies, or recommendations;
- use erroneous data or incompatible forecasts to justify different goals, policies, or recommendations; or
- fail to include or recognize state goals, policies, or recommendations when it is appropriate and feasible to do so.

Federal role

The federal government should also be committed to help implement the plan. The state shall notify the Rhode Island Congressional delegation of the financial enormity of some of the actions called for in the plan, and shall request funding to assist with plan implementation.

Role of Massachusetts

Rhode Island shall work with Massachusetts to assure that many of the actions proposed in the plan are pursued. Sixty percent of the Narragansett Bay watershed lies in Massachusetts. Efforts of the two states must be coordinated so that resources are used most efficiently.

Role of industry

In future implementation activities, the state shall emphasize communication with industries. Industrial users of the Bay must be given an idea of what is reasonably expected of them, in terms of taxes, fees, and regulations. Industries are already concerned about the business climate and competitive disadvantages; they need to be reassured about the plan's long-run economic benefits and recognition of economic development needs. Continued participation and support from industry are essential to the success of the plan. The state shall advocate that the federal government implement a low-interest loan program tailored to assist industries in upgrading to best-available wastewater treatment technology.

Role of the public

People whose activities affect the Bay can often prevent pollution problems, so that costly cleanup or regulatory programs are unnecessary. Public education programs are crucial; for example, in how to maintain septic systems, care for lawns and gardens, and dispose of boat wastes.

The CCMP is intended to be a working guide to future actions that will preserve and restore Narragansett Bay. It calls for agencies, industry, interest groups, and the public to continue the planning process: completing unfinished studies, developing new recommendations, monitoring progress, and revising old recommendations and priorities as conditions change. This should be a living, useful plan that builds on past collective efforts and maintains the momentum of achieving the goals for Narragansett Bay.

PREFACE

Narragansett Bay is arguably the best-studied estuary in the United States, but until now has lacked a single, Bay-wide blueprint for improving its health and sustaining it for generations to come. The purpose of this *Comprehensive Conservation and Management Plan* (CCMP) is to provide that blueprint, after examining and assessing problem areas and possible solutions.

Toward that end, the authors of the CCMP evaluated potential and existing mechanisms for implementing the Plan's recommendations, making suggestions for expanding regulatory responsibilities as well as planning horizons. Authors of the reports and briefing papers that contributed to the Plan are listed in Appendix C; Bay Project staff are shown in Appendix B.

It was left to the Bay Project Management Committee to resolve any conflicts through exhaustive consensus building and principled compromise, a process that was truly remarkable considering the scope of the Project, the volumes of scientific material to be considered, and the many competing and at times contentious uses of the Bay as natural resource, recreational site, fishing ground, and receiving water. The names of the individuals who served on the Management Committee and performed that unenviable task are also listed in Appendix B. Chaired by Malcolm J. Grant, Associate Director of the R.I. Department of Environmental Management, they deserve special recognition for bringing the Plan into being, and will continue to merit recognition as they help bring the Plan into full implementation.

Likewise is credit due members of the Bay Project staff who conducted an extensive program of public outreach and education. Many issues were brought to the Management Committee and addressed as a result of that outreach. This endeavor was spearheaded by Caroline A. Karp, Esq., Project Manager, and Judith E. Korch, Communications Coordinator. Ms. Karp spoke before many different audiences, answering questions and soliciting advice and support for the Project, while Ms. Korch edited an excellent newsletter explaining Bay management issues and how the Project intended to address them. Assistance from the staff of Planners Collaborative, Inc., must also be mentioned.

Because the CCMP was written as an element of the State Guide Plan, certain background information and recommendations in the "Briefing Papers" prepared for the Management Committee had to be digested and re-presented in language appropriate for the Guide Plan. Bruce F. Vild, Principal Planner, of the R.I. Division of Planning, was responsible for that task, working under the direction of Susan P. Morrison, Chief of Systems Planning, and John P. O'Brien,

Supervising Planner. Mr. Vild wrote, edited, and reworked several drafts of Parts 03, 04, and 05, along with the Bibliography and this modest Preface, under Task 209 of the Division's Work Program.

The final revisions to the Plan, representing the consensus of the Bay Project Management Committee, Bay Project Executive Committee, and the State Planning Council, were done by Richard C. Ribb, Environmental Policy Analyst, of the Bay Project staff. The CCMP as the reader sees it now is the product of his editorial work.

The process of developing the Plan is further described in Part 715-01, Introduction.

The Plan is organized in a straightforward way, continuing with Parts 715-02, background; 03, goals; 04, analysis of issues and strategies; 05, implementation; and 06, summary of recommendations and costs. A 24-page Executive Summary appears at the beginning of the Plan.

Funding and guidance for the Narragansett Bay Project were provided by the U.S. Environmental Protection Agency.

The State Planning Council adopted the CCMP as an element of the State Guide Plan on October 8, 1992, and made a few revisions on December 10, 1992.

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EXECUTIVE SUMMARY

INTRODUCTION

The Narragansett Bay *Comprehensive Conservation and Management Plan* (*CCMP*) represents the culmination of a unique experiment in environmental policy-making. Over a period of seven years (1985 to 1992), more than 100 people representing 45 federal, state, and local government agencies, universities, marine trade organizations, environmental advocacy groups, industry, and land development interests met under the aegis of the Narragansett Bay Project (NBP), a member of the U.S. Environmental Protection Agency's (EPA) National Estuary Program, to consider the future of Narragansett Bay and the Narragansett Bay basin.

The NBP's specific mandate under Section 320 of the federal Clean Water Act was to "...recommend priority corrective actions and compliance schedules addressing point and nonpoint sources of pollution to restore and maintain the chemical, physical and biological integrity of the estuary, including restoration and maintenance of water quality, a balanced indigenous population of shellfish, fish and wildlife, and recreational activities in the estuary, and assure that the designated uses of the estuary are protected." In order to satisfy this broad charge, the Bay Project's governing committees directed the completion of over 100 peer-reviewed scientific and policy studies that focused on the following identified issues of concern:

- Impacts of toxic pollutants,
- Impacts of nutrients and eutrophication,
- Land-based impacts on water and habitat quality,
- Health and abundance of living resources,
- Fisheries management,
- Health risk to consumers of seafood, and
- Environmental impacts on commercial and recreational uses of Narragansett Bay.

These studies provided the NBP's governing committees with an objective basis to determine the relative significance of problems confronting the Bay basin in terms of environmental impacts and impairment of water quality-dependent uses of the Bay, *e.g.*, shellfish harvesting. These studies, in combination with NBP briefing papers also provided a starting point for recommending specific actions to protect and restore Narragansett Bay. [See Appendix C for a complete list of NBP publications.]

BACKGROUND: DESCRIPTION OF THE PROBLEM

In many respects, Narragansett Bay is the "Everyman" of American estuaries. Major urban and industrial centers developed along the major rivers tributary to the Bay to take advantage of water supply and easy access to foreign markets from protected deep water ports. As the cities flourished and the region's economic base and transportation options diversified, the population sprawled along the adjacent coastline—accompanied by commercial development and public infrastructure such as roads, public water supplies, and sewers. The Bay's resulting economic importance to the region is clear—in 1989 dollars, the Bay generated almost $2.5 billion in revenues for the State of Rhode Island based on direct exploitation of Bay fisheries, tourism, marine-related industry, marine research and education, and U.S. Navy-related activities. Narragansett Bay's water and habitat quality reflects its urban history and recent suburban pattern of development, as well as the multiple demands placed on it by its citizens.

This history of environmental degradation in the Bay basin can largely be explained by four "universal" attributes of the Narragansett Bay system which continue to affect the pollutants generated in the Bay basin, and the environmental fate of those pollutants in Narragansett Bay. The first attribute is the geography of the Narragansett Bay watershed. The second attribute is population density within the Bay basin; the third is population distribution within the basin;

and the fourth is the trend in population growth and distribution.

The Bay watershed—or the land area that ultimately drains water (and entrained pollutants) to Narragansett Bay—is over ten times larger than the surface area of the Bay itself, and extends well into the Commonwealth of Massachusetts. In fact, 60 percent of the Bay basin lies within the Commonwealth up to the headwaters of the Blackstone and Taunton Rivers, and 67 of the 100 cities and towns in the Bay basin are in Massachusetts. This geographic and political reality is significant because land use and environmental policies throughout the basin ultimately affect Narragansett Bay. For example, a governmental decision to divert water from a Bay tributary for ultimate discharge to another drainage basin reduces the flow in the Bay tributary, thereby affecting the quality of riverine habitat, and reducing the net flow to Narragansett Bay.

Population density within the Bay basin affects both the volumes of water use and ultimate wastewater discharge. Based on the 1980 census, the Narragansett Bay watershed is one of the most densely populated estuarine systems in the country with a population of 1.8 million people—887,863 in Rhode Island and 949,465 in Massachusetts—and an overall density of 1,109 people per square mile compared to a national average of 64 people per square mile. Most of the wastewater flow generated in the basin is treated by one of the 33 wastewater treatment facilities in the basin, although 12 Rhode Island communities are completely unsewered as are several in Massachusetts. Since the population continues to be concentrated in the metropolitan areas of Providence, Rhode Island, and Worcester and Fall River, Massachusetts, the largest volumes of wastewater enter Narragansett Bay at the mouths of the Blackstone, Pawtuxet, Providence-Seekonk, and Taunton Rivers.

Population distribution and land use within the basin also strongly affect the environmental quality of Narragansett Bay. The region's industrial and manufacturing core coincides with the major urban areas in the Blackstone-Providence and Taunton River basins. As a result, the largest volumes of industrial wastewater, and industrial-derived toxic pollutants, also enter Narragansett Bay at the mouths of the Blackstone, Pawtuxet, Providence and Taunton Rivers, and decrease along a down-Bay gradient toward Rhode Island Sound. However, domestic wastewater and point and nonpoint source pollutants generated by commercial, industrial, agricultural, construction and municipal activities in other communities in the basin also enter the Bay in proportion to local population density and land use patterns.

Although the Bay pollution gradient follows the Providence River-Rhode Island Sound axis and matches the history of the basin, projected changes in population growth and population density suggest that a different type and pattern of pollution problem may emerge in the future. The Rhode Island Division of Planning (RIDOP) has projected an average 20 percent growth rate for Rhode Island's suburban and rural communities between 1985 and 2010, compared to a 2.6 percent growth rate in the state's cities, and a statewide growth rate of 9.5 percent. Although 69 percent of the state's population already lives in a coastal city or town, coastal communities are expected to grow more rapidly than the state averages. In addition, based on the projected rate and distribution of growth, the RIDOP estimates that 88 percent of the developable lands in Rhode Island could be fully developed by 2010. (Note: Local zoning ordinances in effect in 1979 would authorize development of 95.5 percent of Rhode Island lands under local jurisdiction.) If this trend toward suburbanization and development of rural areas continues or accelerates, there will be profound consequences for the region's wastewater and waste disposal infrastructure related to increased population. There will also be detrimental consequences for the region's natural resources and remnant critical areas related to habitat loss and degradation.

(The major human impacts on Narragansett Bay are described below and summarized in Table I by geographic region.)

SEWAGE

Human sewage represents the most ubiquitous and overriding pollution problem in the Narragansett Bay basin. Based on 1990 census figures for Rhode Island and Massachusetts and per capita estimates of water use, over 125 million gallons of wastewater carrying a mixture of sanitary and household wastes are discharged each day to municipal wastewater treatment facilities (WWTF) and on-site sewage disposal systems (OSDS) in the basin. The majority of this wastestream receives some level of treatment and disinfection prior to discharge to the Bay and its tributaries. However, 37 percent of Rhode Island's population depends upon OSDSs to treat residential and commercial wastes. In addition, over 100 combined sewer overflows (CSO) in the Providence River region and the City of Fall River discharge a mixture of untreated sewage and stormwater to the Bay after rain events. As a result, multiple sources of untreated and partially treated sewage continue to discharge to the Bay—almost 100 years after the risks associated with human exposure to water-borne bacteria and viruses were first described.

All 33 WWTFs in the basin use chlorine disinfection which is relatively effective at killing bacteria but ineffective at killing viruses, including potential human pathogens responsible for causing illnesses such as polio, hepatitis, and gastroenteritis. On the one hand, cholera, typhoid, polio and infectious hepatitis appear to be water-borne diseases of the past in the northeast because of improvements in sanitary conditions, medical advances, improvements in wastewater treatment, and the development of bacteriological standards governing the certification of Bay waters for commercial and recreational use. However, sewage discharges to Narragansett Bay and its tributaries continue to pose a threat to public health and water quality-dependent uses of Bay waters such as swimming and shellfish harvesting.

At the present time, 40 percent of Narragansett Bay is permanently or conditionally closed to shellfish harvesting because of actual or suspected contamination from sewage-derived bacteria and viruses. The Providence River and Mount Hope Bay have been permanently closed to shellfish harvesting since the 1940s, and upper Narragansett Bay is routinely closed following rain storms because of CSO discharges of untreated sewage. Perhaps more disturbingly, however, all the closures of recent years have occurred in suburban areas such as the Narrow and Kickemuit Rivers, Point Judith Pond, and the coves surrounding Greenwich Bay—all as a result of actual or suspected evidence of sewage contamination from septic systems, storm drains and boats. Several bathing beaches in upper Narragansett Bay are also closed because of sewage contamination, and a number of coves and embayments—including the Pawtuxet, Providence, Seekonk, Kickemuit, Cole and Lees Rivers; Greenwich, Apponaug and Warwick Coves; and portions of Mount Hope Bay—suffer from seasonal dissolved oxygen depletion, algal blooms and occasional fish kills related to organic loadings from sanitary wastewater inputs.

In urban areas, point sources, including WWTFs, WWTF bypasses and CSOs represent the major sources of human fecal waste. The CSOs are also a major source of floatable human wastes, which foul the coastline and aesthetically limit use of the shore. In suburban and developing coastal areas, the major sources of human fecal wastes include failed and failing OSDSs, illegal sewer cross-connections to storm drains, and improper sewage discharges from vessels.

Although the population in the basin has grown and will continue to grow, sewage contamination represents a largely unnecessary public health and environmental risk given the treatment, disposal and disinfection technologies that are currently available. The region's failure to more carefully manage and abate the discharge of untreated human sanitary wastes will inevitably result in additional closures of shellfish harvesting areas, overall environmental degradation, and economic losses related to further limitations on water quality-dependent uses of the Bay. Therefore, public investment in more effec-

tive WWTF disinfection technologies and CSO abatement should be the highest priorities in urban areas of the Bay basin. The highest priority in suburbanizing areas and rural areas of the basin should be the implementation of more effective controls on the location, density and use of OSDSs in order to manage the incremental, cumulative impacts of population growth and land development on receiving water quality.

TOXIC POLLUTANTS

The Providence-Worcester corridor along the Blackstone River is acknowledged as the birthplace of the Industrial Revolution in the United States, and upper Narragansett Bay continues to reflect this heritage. Significant areas of the Providence River and its major tributaries, including the Blackstone, Pawtuxet, Woonasquatucket, Moshassuck and Ten Mile Rivers, continue to exceed federal and state water quality standards designed to protect aquatic life from exposure to toxic pollutants. Other less urban areas of the Bay, including parts of Portsmouth and Newport Harbor, Greenwich Bay and Mount Hope Bay, also show evidence of significant metals contamination although not in violation of federal and state standards.

Industry has historically been the largest source of toxic pollutant discharges to Narragansett Bay. However, federal, state, local and industry initiatives undertaken pursuant to the federal Clean Water Act have resulted in significant reductions in industrial pollutant loadings since the 1970s. As a result, non-industrial sources such as commercial and household toxic and hazardous wastes, motor vehicle emissions and leaks, and urban and highway runoff are increasingly significant sources of contamination throughout the Bay basin. In addition, suburbanization and diffusion of commercial growth away from existing industrial centers, combined with the emergence of new industries with "exotic" waste characteristics, have resulted in new sources and types of surface and groundwater contamination in developing areas of the Bay basin.

The levels of measured toxic pollutants in Bay waters do not pose an immediate public health risk, in part because the most severely contaminated areas are already closed to fish and shellfish harvesting due to sewage contamination. However, the presence and persistence of toxic pollutants in the environment contribute to habitat degradation, reduced fitness of aquatic organisms, and an unnecessary additive public health risk for some consumers of seafood harvested from the Providence River region. Elevated toxic pollutant levels in municipal sewage sludge and septage also limit the region's ability to consider alternative disposal methods such as agricultural or residential use of composted solid wastes. In addition, the presence of contaminated sediments in the Providence River basin and other commercially important ports and harbors complicates decision making about dredging to support navigation and boating activity. Unless a concerted effort is made to reduce domestic, commercial, industrial, urban and agricultural use and disposal of toxic pollutants, citizens of Rhode Island and Massachusetts should expect to see limited water quality improvements related to continuing source reduction efforts by industry.

LIVING RESOURCES

Many federal and state agencies with jurisdiction in Rhode Island and Massachusetts have programs to protect discrete elements of the Bay ecosystem. For example, the Rhode Island Department of Environmental Management (RIDEM) and the Coastal Resources Management Council (CRMC) have programs to protect drinking water supplies, tidal and non-tidal wetlands, barrier beaches, commercially harvested species, and state and federally-listed threatened and endangered species. However, these programs are not adequately coordinated to effectively protect water supply recharge areas, upland riparian corridors, intertidal and subtidal habitats, or key breeding, nursery and foraging habitats. Nor are they effectively coordinated to preserve unique, ecologically important, or remnant natural resources or populations.

Both Rhode Island and Massachusetts have experienced declines and collapses of important fisheries in recent years. Rhode Island, for example, recently imposed a moratorium on commercial and recreational harvesting of winter flounder in Narragansett Bay, Little Narragansett Bay, and the coastal salt ponds in order to allow the native winter flounder population to recover from overfishing. Other historically important fisheries such as the oyster, bay scallop, soft shell clam, Atlantic salmon, shad, menhaden, tautog, and windowpane flounder have experienced similar declines due to overfishing, physical obstruction of river flow and drainage, destruction of key subtidal habitats, and pollution. In addition, apart from the states' efforts to protect state and federally-listed threatened and endangered species, little governmental attention has been paid to protecting non-commercially important species or their associated habitats.

A concerted regional effort will be necessary to effectively manage (and sustain) commercial and recreational harvests of indigenous fisheries. In addition, land use controls and land acquisition efforts within Rhode Island and Massachusetts should be coordinated to focus on critical areas threatened by suburbanization and rural development in order to protect or restore remnant critical habitats for native plants and animals, as well as to protect human use and enjoyment of these resources. The region's failure to regulate the use of its natural resources will continue the present cycle of collapsed fisheries and economic hardship for the fishing community. The region's failure to regulate the development of its critical areas will ultimately result in the loss of biological diversity, sustainable ecosystem function, and human use and enjoyment of these resources.

PROGRESS TO DATE AND THE UNFINISHED AGENDA

A great deal of progress has been made in spite of this picture. Data compiled by the NBP suggest that programs initiated under the federal Clean Water Act, such as mandatory secondary sewage treatment, the industrial pretreatment program, and the phase-out of leaded gasoline, have measurably improved dissolved oxygen concentrations and reduced toxic pollutant loadings to Narragansett Bay. The most significant evidence of the environmental benefit of this investment can be seen in the Providence River. Recent state initiatives such as mandatory recycling and toxics' source reduction programs are expected to further reduce pollutant inputs. Rhode Island's open space acquisition program and its recent moratorium on winter flounder fishing also represent important initiatives with respect to protection of critical resources, and establishing modern principles of resource management.

However, a virtual revolution in land management philosophy and practice will be required to deal with the incremental degradation of water quality related to population growth in the Bay basin. Coastal towns in the Narragansett Bay basin have experienced dramatic population growth and development since the 1970s. The Town of Narragansett, for example, tripled its population between 1960 and 1990 and the Town of East Greenwich essentially doubled over the same period. As a result, many of the developing communities fronting Narragansett Bay lack the necessary infrastructure, *e.g.*, public water and sewers, to cope with the consequences of this rate of growth. Since demographic projections indicate that future growth will continue to concentrate in rural and suburban areas, many of which are unsewered, the population's dependency upon OSDSs will also increase. The environmental consequences of failing to effectively manage population growth are readily observable in terms of increasing restrictions on shellfish harvesting in the vicinity of intensively developing residential areas and crowded harbors, increased fouling of the shore by floatable human wastes, and the increased incidence and geographic extent of seasonal low oxygen problems, algal blooms and fish kills.

Without effective land use controls, the trend toward suburbanization and dispersion of the population to currently undeveloped areas of the Bay basin will also result in the physical

loss of remaining unprotected natural habitats. In addition, the unregulated development of open space within the watershed—including deforestation and encroachment on wetlands—can also disrupt the natural hydrological cycle, increase stormwater runoff, promote erosion, and result in new point and nonpoint sources of pollution. Evidence of these effects already exists. For example, the RIDOP reported a 15 percent decrease in the acreage of forested lands between 1982 and 1988 associated with the recent development boom, and the U.S. Department of Agriculture Soil Conservation Service (USDA SCS) estimates that over 100,000 tons of sediment are washed into the Bay and its tributaries each year as the result of unregulated runoff from construction sites, road surfaces, and agricultural lands. In addition, the RIDEM estimates that, as of 1991, 45 percent of its 674 river miles are threatened by nonpoint and point sources of pollution, while an additional 25 percent of the state's rivers are only partially supporting or are not supporting their designated uses. The consequences of failing to effectively manage land use include the physical loss and/or degradation of natural resources, loss of biological diversity, increasing limitations on water quality-dependent uses, and ultimately, a decrease in the Bay ecosystem's sustainable revenue generating potential.

SOLUTIONS: THE NARRAGANSETT BAY *CCMP*

The Narragansett Bay *CCMP* reflects the complexity of the Bay's environmental problems, the diversity of pollutant sources, the variety of demands that continue to be placed on the Bay's resources, and the difficulty in identifying simple solutions. The complexity of the *CCMP* also reflects the complexity of the planning process itself. However, the Project's governing committees ultimately agreed on the environmental, social, and economic necessity of protecting and restoring Narragansett Bay. As a result, the *CCMP* represents a community vision of the measures that must be taken by the State of Rhode Island and the Commonwealth of Massachusetts in conjunction with the municipalities and the federal government, to achieve the following goals for Narragansett Bay:

1. prevent further degradation of water quality;

2. protect diminishing high quality critical resource areas;

3. improve management of Bay-dependent living resources;

4. rehabilitate degraded waters throughout the Bay basin; and

5. coordinate and oversee implementation of the *CCMP*.

The organization of the *CCMP*, summary cost and financing information, and highest priority implementation actions are briefly described below.

ORGANIZATION AND USE OF THE *CCMP*

The *CCMP* is intended first and foremost to be a "blueprint" for immediate coordinated action by federal, state, and local implementing authorities. (The ten highest priority implementation actions are briefly described below, by goal, and summarized in Table II with information on projected costs and implementation status.) However, the *CCMP* acknowledges that many of the recommended actions will have to be staged over many years in order to achieve measurable progress and respond to changing demographic, environmental and economic conditions in the Bay basin. Therefore, the "Issues, Objectives, and Strategies" section of the *CCMP* (Part 715-04) is intended for use by implementing authorities and other users with a specialized interest in particular issues over a five to ten year planning horizon. Related high priority recommendations in each chapter are identified with bolded text and a checkmark. (Table 715-06(1) Summary of *CCMP* Recommendations summarizes all *CCMP* actions according to whether the primary focus of the recommended initiative is on additional policy development, planning, regulation, public education, research or capital improvement.)

Readers should also note that space has been reserved for *CCMP* chapters on Greenwich Bay, Management of Living Marine Resources, Management of Marine and Riverine Sediments, Bay Governance, and Role of Public Participation in *CCMP* Implementation. The Management of Living Marine Resources, and Management of Marine and Riverine Sediments chapters should be completed as soon as possible in order to address the continuing trend toward collapse of important fisheries and loss of critical habitats; and the need to resolve the region's dredging and sediment management concerns. The Role of Public Participation chapter should also be completed as a high priority because of the need for broad public understanding of its role in environmental protection and the environmental and economic consequences of failing to act. Sufficient information currently exists to address these subject areas. Completion of the Greenwich Bay chapter should be deferred until the RIDEM and CRMC complete the preliminary basin plan and recommend comprehensive pollution abatement and growth management initiatives to restore and protect Greenwich Bay.

Since the *CCMP* has been developed based on information collected between 1985 and 1991, the Plan should be revised as new information becomes available, new solutions emerge, and new priorities are established. In particular, the *CCMP* should not be used to stifle independent, creative solutions to the described problems, and should not be interpreted to dictate implementation schedules independent of the federal, state and local governments' competing social obligations and ability to pay. The "Implementation" section (715-05) provides an overview of the existing system of Bay governance, proposes an institutional structure for implementing the *CCMP*, and includes summary cost and financial information as the basis for future financial planning.

IMPLEMENTING THE *CCMP*

The *CCMP* explicitly recognizes that a sustained and coordinated interstate and interagency effort will be required over many years to achieve measurable progress in protecting and restoring Narragansett Bay. The Plan also recognizes that progress toward implementation will depend upon the availability of adequate and sustained funding, particularly for the state and local implementing authorities. The institutional and financial initiatives recommended in the *CCMP* are expected to provide the platform to support on-going implementation efforts. In addition, a variety of actions taken between 1985 and 1992 will also contribute to *CCMP* implementation. These institutional and financial efforts to assure implementation are briefly described below, and discussed in much greater detail in Part 715-05 of the Plan.

The *CCMP* recommends that the NBP committee structure be maintained in order to coordinate interstate and interagency efforts, and provide a permanent forum for the public to participate in future *CCMP* implementation and planning. The EPA Region I, RIDEM, RIDOP, and CRMC have agreed to continue their historic leadership role in the future by participating on the new Narragansett Bay Implementation Committee. Since many *CCMP* recommendations will depend upon municipal governments in Rhode Island and Massachusetts, it is essential that municipal representatives also serve on the Implementation Committee. Continued representation from academia, environmental advocacy groups, the business community, and marine trade organizations should be assured via establishment of a Narragansett Bay Policy Committee that assumes the responsibilities of the existing NBP Management Committee. In addition, *CCMP* implementation efforts should be coordinated with regional planning efforts such as the Bay State-Ocean State Compact, the Rhode Island Rivers Council, and RIDOP's *Greenspace 2000* initiative.

Although there is broad institutional support for the actions recommended in the *CCMP*, all the participants in the planning process acknowledge that progress toward effective implementation will be negligible without coordinated and predictable funding, partic-

ularly since the total estimated cost of implementing the *CCMP* over the next five years (1992 to 1997) is $392 million—$283 million for Rhode Island, and $109 million for Massachusetts. It is important, however, to consider several aspects of these cost projections, and the available revenue options.

1. The total estimated cost of *CCMP* implementation over the next five years is $20.2 million for Rhode Island and $10.3 million for Massachusetts—excluding projected capital costs associated with federally-mandated CSO abatement, proposed remediation of contaminated sediments on the Blackstone River, a state match for a $13 million FHWA grant, and proposed reauthorization of Rhode Island's Sewer and Water Supply Failure Fund. Over 90 percent of Rhode Island's and Massachusetts' total *CCMP* costs between 1992 and 1997 are associated with mandatory CSO abatement and proposed remediation of Blackstone River sediments.

2. If Rhode Island's total estimated non-capital costs ($20.2 million) were distributed evenly over the next five years, Rhode Island's first year expenditures would be $4.04 million, or 0.30 percent of Rhode Island's 1992 state budget. This estimated annual cost would amount to an annual, per capita cost of $4.03 to each of Rhode Island's 1,003,464 citizens for five years. Complete state financing, and a per capita distribution of *CCMP* costs are not realistic or desirable. However, the *CCMP* is clearly affordable over the long term if not the short term.

3. The procedure used to estimate the cost of *CCMP* implementation assumes that every action recommended in the Plan requires *new* funding (i.e., existing funds and staff time that could potentially be directed toward CCMP implementation are not included in the cost estimates). This overestimates the cost of implementation in two respects. First, many recommended actions have been initiated since the planning process began in June 1990—several as a direct result of the *CCMP* planning process. Second, *CCMP* planning estimates do not account for existing revenue sources such as the Aqua Fund bond fund and the State Revolving Funds, that may, in fact, be partially available to help finance *CCMP* implementation, recognizing that *CCMP* priorities will compete with other environmental priorities for existing revenues.

4. Although the *CCMP* cost estimates do not include expected federal costs of implementation, the *CCMP* explicitly states that federal financial assistance will be necessary to assist with implementation, particularly with respect to planned capital improvement projects. In fact, the *CCMP* has already acted as a "magnet" for external implementation funding, and may continue to do so in the future. (For example, Rhode Island received a $13 million demonstration grant under the federal Surface Transportation Act of 1991 to abate highway runoff from Interstate 95 and other coastal roadways that discharge runoff to Narragansett Bay.)

5. *CCMP* cost estimates do not include private sector costs associated with implementation. However, the NBP worked closely with affected business groups to identify economic incentives and financing options to facilitate private sector compliance with new regulatory requirements. These recommendations are incorporated into the *CCMP*. In addition, unit costs for implementing specific *CCMP* actions are reported where information is available. For example, the average cost of installing a marina pump-out facility, and the average cost per pump-out are reported, as are the average expected costs of establishing a wastewater management district (WWMD), and the annual homeowner cost of belonging to a WWMD.

6. Municipal costs are reported in the plan where available and where an accurate estimation is possible. However, the ultimate implementation costs for municipalities will vary depending on differing environmental and institutional conditions. In addition, the estimated municipal implementation costs do not include ultimate program and capital costs that may result from completion of underlying planning activities, or costs that are expected to be completely recoverable from user fees. For detailed cost estimation information, refer to the NBP technical

report, *CCMP Cost Estimation and Funding Strategy* (Apogee Research Inc./NBP, 1992)

7. A public opinion survey completed for the NBP in 1991 indicated that 47 percent of the 430 Rhode Island and 102 Massachusetts respondents believe that reducing pollution in the Bay should be an immediate priority, while an additional 46 percent believe that some work should begin immediately, but that more action should wait until the economy becomes stronger. In addition, the majority of the respondents were personally willing to pay more to protect the future of the Bay and its watershed. Although attitudes differ as to the best way to pay for cleaning up the Bay, strong support exists for several funding options:

- 91 percent believe that polluters should pay for environmental remediation through fines, taxes, or other charges;

- 79 percent would support personal tax increases to fund remedial efforts, providing that increases are not excessive and funds are used for environmental purposes;

- 78 percent would support a bond issue to fund Bay improvements; and

- 63 percent would accept increased user fees, such as increased fees for fishing licenses and beach access, as long as the increases are reasonable and the funds are dedicated for Bay-related purposes.

[Note: the margin of error for the Rhode Island portion of the survey was +/- 4.7%.]

8. Finally, the projected cost of *CCMP* implementation should be viewed within a broader economic context in two respects. First, a healthy Bay is a revenue generator—over $2 billion in revenues were generated by Bay-related activities in 1989, mostly attributable to tourism. However, the region's failure to invest in pollution abatement, source reduction, and sustainable use of the Bay's natural resources will ultimately have negative economic consequences for the entire region in terms of reduced fisheries landings, declining tourism-related revenues, and diminishing quality of life for citizens of the Bay basin. Second, *CCMP* implementation can contribute directly to economic growth in the region in terms of creating jobs and stimulating the development of new industries and technologies. For example, based on recommendations presented in the *CCMP*, area businesses could successfully exploit emerging national and international markets for innovative pollution abatement, source reduction, and waste treatment technologies. The *CCMP* also challenges public and private entrepreneurs to establish new, sustainable marine-related businesses related to aquaculture, marine research and monitoring, and marine education.

In summary, the cost of implementing the *CCMP* may superficially seem high. However, significant progress toward implementation is financially achievable if the political and institutional will exists to examine existing revenue sources, and to tailor new revenue sources to agreed-upon *CCMP* priorities.

Implementation efforts undertaken during the *CCMP* planning process will also contribute to the success of future actions to protect and restore Narragansett Bay. The NBP's efforts to develop practical planning "tools", establish permanent technical assistance programs, and obtain additional funding to support recommended planning and pollution abatement initiatives are described in Section 715-01-04 (Process of Plan Development). In addition, many agencies and organizations have also begun to implement portions of the *CCMP*. These efforts are recorded in the summary matrices following each *CCMP* chapter.

However, the "Letters of Support" (Appendix G), and the "Preliminary Agreements to Implement the Approved *CCMP*" (Section 715-05-06) possibly represent the most significant evidence of a basin-wide commitment to implement the *CCMP*. The "Letters" and "Preliminary Agreements" speak for themselves with respect to institutional willingness to participate in *CCMP* imple-

mentation. The authors of these documents clearly recognize that the *CCMP* is not perfect, that it is, however, a *plan* and, therefore, can be revised as new information becomes available and new solutions emerge. The agency agreements also explicitly state that real funding constraints exist and that successful implementation will depend upon coordinated action by federal, state and local implementing authorities, and the private sector. Most importantly, however, the "Letters of Support", and the "Preliminary Agreements" implicitly recognize that moving forward with implementation of the *CCMP* is the most responsible course of action to protect the region's long-term investment in and enjoyment of Narragansett Bay.

HIGHEST PRIORITY ACTIONS FOR IMPLEMENTATION

GOAL: ***The State of Rhode Island and the Commonwealth of Massachusetts, in conjunction with the Federal government and the municipalities, should act to prevent further degradation and incrementally improve water quality in developing coastal areas with deteriorating water quality.***

The following actions should be undertaken as soon as possible in order to prevent further degradation of water quality in rural and suburbanizing areas of the Narragansett Bay basin:

ACTION: The State of Rhode Island and the Commonwealth of Massachusetts should adopt legislation requiring municipalities to establish wastewater management districts (WWMD) in order to assure the proper inspection and maintenance of on-site sewage disposal systems (OSDS). In addition, the State and the Commonwealth should amend existing regulations governing siting, design, construction, and maintenance of on-site sewage disposal systems.

Rhode Island passed legislation in 1987 enabling municipalities to establish WWMDs to oversee the maintenance of OSDSs, and manage septage disposal within their jurisdictions. Although several municipalities are presently considering adopting WWMD ordinances, no districts have been established to date in the Narragansett Bay basin. Since the statewide OSDS failure rate is estimated to be three percent, and reportedly may be as high as 15 percent in some communities, WWMDs must be established to provide routine inspection, maintenance, and enforcement of residential and commercial OSDSs.

Both states also need to modernize the rules and regulations governing new, repaired, and replaced OSDSs. The revised regulations should address siting criteria, density limits in critical resource areas, buffer and set-back requirements, prohibitions on the use of chemical additives and garbage disposals, and enforcement. In addition, design and performance standards should be established for a range of on-site wastewater treatment technologies that can be approved for use in areas where conventional systems do not adequately protect receiving waters and/or habitat.

ACTION: The State of Rhode Island and the Commonwealth of Massachusetts should prepare a marina pump-out facility siting plan for Narragansett Bay that includes a consistent written policy for (1) regulating the construction of marinas, docks, and mooring fields; and (2) enforcing prohibitions against boater discharges in Narragansett Bay.

As of 1989, over 160 marinas, boat yards, and boat ramps were providing services to an estimated 58,000 registered and unregistered boaters in Rhode Island and Massachusetts portions of Narragansett Bay. However, only five marine pump-out stations were in operation in 1991—although three additional stations in Narragansett Bay and four stations on Block Island are expected to be in operation by Summer 1992. Although federal and state law prohibits the discharge of improperly treated vessel wastes within the three-mile territorial limit, the lack of available services, as well as observed violations of bacteriological standards in the vicinity of marine facilities, suggest that illegal discharges occur. A potentially serious public health risk exists to the extent that discharges of untreated or partially treated sewage occur near bathing beaches or shellfish harvesting areas.

Efforts to implement this recommendation are partially complete. However, RIDEM, CRMC, and Massachusetts authorities will need to reconcile inconsistent water quality and water use standards governing the use of

tidal waters in order to regulate the future construction or expansion of marine facilities. These agencies should also continue to work with harbormasters, marine trade organizations and boaters through the RIDEM Boating Safety courses and CRMC's Harbor Management Planning process to establish marine pump-out facilities, and investigate the use of boat inspection stations. Low interest loans for construction of publicly maintained pump-out facilities may be available from the Rhode Island Aqua Fund, the State Revolving Fund, or the states' Wallop-Breaux funds. Operating costs of the facilities should be recoverable from user fees. Ultimately, RIDEM and CRMC should work with coastal communities to petition the EPA to designate all or part of Narragansett Bay as a "no discharge area" in order to help protect water quality-dependent uses of Narragansett Bay.

The intent of CCMP recommendations concerning the reconciliation of CRMC and RIDEM water quality and water use standards is to:

1. Identify geographical and programmatic areas where CRMC water use and RIDEM water quality standards result in inconsistent regulation of permitted activities;

2. Reconcile, to the greatest extent possible, identified differences in water use and water quality classifications on a programmatic basis;

3. Establish appropriate memoranda of agreement between RIDEM and CRMC to ensure permitting activities by both agencies support the maintenance of water-dependent uses provided for in established water quality standards.

ACTION: The Federal government, the State of Rhode Island, and the Commonwealth of Massachusetts should develop useful guidance for municipal officials regarding (1) "best management practices" (BMPs) to control nonpoint source pollution, (2) innovative, environmentally protective land management and growth management practices, and (3) development of local and regional stormwater management plans to reduce or treat storm runoff.

Rhode Island municipalities exercise control over land use via zoning ordinances, special use ordinances, and direct state grants of authority. Municipal control over land use has recently been clarified and strengthened as the result of the Comprehensive Planning and Land Use Regulation Act of 1988 and the Zoning Enabling Act of 1991 which require communities to develop local comprehensive land use plans following state guidelines, and to adopt zoning ordinances and maps in conformance with the plans. These statutes also broaden the authority of Rhode Island municipalities to adopt and enforce environmentally protective policies. However, many communities still rely on volunteer planning and zoning boards—some without paid professional planning staffs, and few with environmentally trained professionals—to make complicated land use decisions.

In order to help assure predictable and environmentally appropriate land use decisions, local officials need standardized, practical guidance that describes pollution sources, pollution abatement options, and innovative land use and growth management controls. For example, the states should develop detailed guidance regarding regional stormwater management options, management of stormwater utilities, and design and performance standards for recommended "best management practices". Just as importantly, the municipalities need guidance on how to apply and defend the use of innovative growth and land use management techniques such as overlay protection districts, cluster zoning, development scheduling, and pollutant loading ordinances. Local officials also need straightforward descriptions of state regulatory requirements, and increased access to training and technical assistance in implementing new programs.

A great deal of useful information regarding structural and non-structural "best management practices" has already been compiled. For example, EPA has sponsored

the states' Nonpoint Source Management Programs pursuant to Section 319 of the Clean Water Act, and has prepared draft guidance for implementation of the states' Coastal Nonpoint Pollution Control Programs, as required by Section 6217 of the 1990 Amendments to the Coastal Zone Management Act. The guidance produced by the RIDOP and the Rhode Island Land Management Project to assist communities with the development of their local comprehensive plans provides the basis for future educational efforts. State efforts to prepare this information and provide technical assistance should continue. However, these efforts must be coordinated through a statewide nonpoint source advisory committee that is jointly chaired by the state environmental protection and coastal zone management agencies in order to assure consistency and avoid unnecessary duplication of effort.

GOAL: The State of Rhode Island and the Commonwealth of Massachusetts, in conjunction with the Federal government and the municipalities, should act to protect diminishing high quality critical resource areas throughout the Bay basin.

The following actions should be taken in order to effectively protect diminishing high quality critical resources in the Narragansett Bay basin:

ACTION: The State of Rhode Island and the Commonwealth of Massachusetts should develop statewide *Critical Resource Protection Policies* that include: (1) objective criteria for designating critical resources and critical resource protection areas, (2) a Geo-graphic Information System-based mapped inventory of identified resources, and (3) regulatory and non-regulatory controls for protecting identified critical resources.

Sustained use of coastal aquatic and living resources may require some areas to be retained in their natural states. For example, protection of drinking water supplies will require some limitations on development within water supply recharge areas. Similarly, critical nursery, breeding and foraging habitat for Bay fisheries, waterfowl and threatened and endangered species will have to be managed in order to protect the long-term viability of these populations. Effective protection of these coastal resources, however, will depend upon coordinated efforts to manage adjacent and upstream land areas.

The RIDOP's *Greenspace 2000* planning effort will assist Rhode Island in identifying resources that should be protected for aesthetic, recreational, and environmental reasons. The habitat inventory prepared by the NBP will also help with respect to identification of critical coastal and subtidal habitats and resources. In addition, Massachusetts' recent amendments to its Threatened and Endangered Species Act, which authorize public and private entities to nominate areas for designation as *Areas of Environmental Concern*, the Scituate Reservoir Watershed Plan, and CRMC's more recent Special Area Management (SAM) Plans provide models for managing future growth in designated critical areas.

New funds will be required to support this effort, although some funding may be available through federal grants to RIDEM for *CCMP* implementation. These funds will not be sufficient, however, to support the mapping effort or the necessary participation of state and local agencies.

ACTION: The Rhode Island Coastal Resources Management Council (CRMC), the Rhode Island Department of Environmental Management (RIDEM), and other state and local planning and implementing authorities should undertake the preparation of a *Special Area Management (SAM) Plan* for Greenwich Bay.

The strengths of the CRMC's *SAM Plan* process are that it recognizes the role of local government in governing land use, and that it can be used as a vehicle to focus the efforts

of state regulatory agencies. The Greenwich Bay *SAM Plan* should explicitly address point and nonpoint pollution sources, the need for additional sewering in the Greenwich Bay basin based on existing and projected population growth, long-term management of the Greenwich Bay Shellfish Management Area, and protection of remaining critical marine resources. Data collected by the NBP and others, including an engineering review of wastewater treatment infrastructure in the basin, should be used to develop the SAM Plan in combination with local land use and facilities plans.

Partial funding for development of a preliminary Greenwich Bay basin plan may be available via a Rhode Island Aqua Fund grant to the NBP, and an interagency agreement to prepare the plan has been in existence since November 1990. Additional funds may be necessary to develop a more detailed *SAM Plan*, and will be necessary to fund eventual implementation of point and nonpoint source controls.

GOAL: ***The State of Rhode Island and the Commonwealth of Massachusetts, in conjunction with the federal government, should act to more effectively manage commercially, recreationally, and ecologically important estuarine-dependent living resources.***

The following actions should be taken in order to assure that a balanced and biologically diverse indigenous population of estuarine-dependent flora and fauna is maintained in Narragansett Bay:

ACTION: The State of Rhode Island and the Commonwealth of Massachusetts should develop species-specific management plans for managing: (1) commercially, recreationally, and ecologically important fish and shellfish, (2) all threatened and endangered estuarine-dependent plants and animals, and (3) the re-introduction of native anadromous and catadromous fisheries to Bay tributaries, wherever possible.

Rhode Island's wildlife management efforts primarily focus on commercially harvestable living resources because of limited state appropriations, staffing shortages, and the requirements of federal granting agencies. Apart from the RIDEM Natural Heritage program's efforts to monitor the distribution and abundance of threatened and endangered species, there is no systematic effort to manage ecologically important estuarine-dependent plants and animals, or their habitats. In addition, the RIDEM Division of Fish and Wildlife's efforts to manage commercially important fisheries and re-establish native anadromous fisheries rarely include efforts to protect critical breeding or nursery habitats or related elements of the ecosystem.

Therefore, the proposed management plans should identify the causes of observed declines in Narragansett Bay fish, invertebrate, and plant species, and propose specific management strategies for their protection, restoration, and management. The plans should also address protection and management of key breeding, spawning, and foraging habitats of estuarine-dependent plants and animals. A Narragansett Bay *Quahog Management Plan* should be considered the highest priority because of the economic and historic importance of the quahog fishery in Rhode Island, and the effect of sewage contamination of coastal waters on the future of the industry. This plan should be completed prior to any decision to re-open Mount Hope Bay or upper Narragansett Bay to shellfish harvesting as a result of CSO abatement in these areas. Native anadromous fisheries also deserve special attention because of their reliance on unimpaired riverine water quality and unrestricted river flow. Restoration of native fisheries such as shad and Atlantic salmon should be viewed as indicators of

riverine health as the Bay's tributaries are restored.

The RIDEM Division of Fish and Wildlife has recently completed a winter flounder management plan, as well as species' profiles for several commercially and recreationally important fishes. The profiles represent an important source of information to support the development of subsequent management plans. Additional state funding will be required to support this effort. However, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service should be strongly encouraged to expand or revise their grant eligibility criteria to support the states' efforts to develop these management plans, particularly for ecologically important species and their associated habitats.

GOAL: The State of Rhode Island and the Commonwealth of Massachusetts, in conjunction with the Federal government and the municipalities, should act to rehabilitate degraded waters in the Bay basin and restore water quality-dependent uses of Narragansett Bay.

The following actions should be initiated as soon as possible in order to reduce the discharge of toxic pollutants, untreated fecal wastes, and sewage-derived floatables to Narragansett Bay and its tributary waters:

ACTION: The U.S. Environmental Protection Agency (EPA), the State of Rhode Island, and the Commonwealth of Massachusetts should: (1) revise existing municipal and industrial discharge permits to include enforceable, numeric, and chemical-specific limits for all toxic chemicals listed on the Narragansett Bay "List of Toxics of Concern," (2) enforce compliance with these revised discharge limits, and (3) include other significant non-industrial sources of toxic chemicals within these regulatory programs in order to meet state water quality goals for state waters.

There is persuasive scientific evidence that the regulatory programs initiated pursuant to the Federal Clean Water Act, in combination with voluntary source reduction efforts by industry, improvements in wastewater treatment technology, and outright product bans, have been moderately successful in reducing toxic pollutant discharges to Narragansett Bay. However, the existing federal and state regulatory programs control only some of the pollutant sources and pollutants that are potentially of public health or environmental concern. In addition, due to competing program requirements, existing chemical limits intended to protect human health and aquatic life are rarely enforced by EPA, the states, or the municipalities. Although EPA and the states should focus on regulating discharges of toxic pollutants, they should also support efforts to reduce the use of these pollutants. Innovative efforts by organizations such as Rhode Island's Hazardous Waste Reduction Program, Massachusetts' Blackstone Project and the Rhode Island Pollution Prevention Council to promote source reduction (*e.g.*, conservation, raw material substitution, recycling, use of recycled and reclaimed materials) should, therefore, continue to be supported.
Additional funds will be required to support expansion of existing regulatory programs at both the state and municipal level. Potential funding sources include discharge fees assessed on the basis of the volume of water used and/or pollutant characteristics of the waste, penalties for violations of discharge limits, set-asides from the *Hard to Dispose of Materials* tax, and general appropriations. The states' source reduction efforts should also be funded from these revenue sources.

ACTION: The U.S. Environmental Protection Agency (EPA), the State of Rhode Island, the Commonwealth of Massachusetts, and the relevant municipalities and publicly owned wastewater treatment facilities (WWTFs) should proceed with current efforts to abate the combined sewer overflows (CSOs) in Mount Hope Bay and the

Providence and Blackstone Rivers in accordance with a statewide CSO abatement priority ranking system.

CSO abatement is required by EPA, RIDEM, and the Massachusetts Department of Environmental Protection completely independently of the *CCMP*. CSOs in the City of Fall River are directly and overwhelmingly responsible for the closure of Mount Hope Bay to shellfishing. The City of Fall River is presently under an EPA compliance order to abate these CSOs, and has reportedly eliminated illegal dry weather discharges to the Quequechan River. Rhode Island and Massachusetts should synchronize negotiation of interstate agreements about Mount Hope Bay water quality standards, and future plans for regulating shellfish harvesting with Massachusetts' plans for abatement of the Fall River CSOs.

CSOs and WWTF bypasses in the Providence-Blackstone-Seekonk Rivers were responsible for closing the conditional shellfishing areas in upper Narragansett Bay for 281 days in 1990. Until recently, jurisdiction over the 89 CSOs in the Providence-Seekonk River basins was divided between the Narragansett Bay Water Quality District Commission (NBC) and the Blackstone Valley District Commission (BVDC). The merger of the BVDC and the NBC in early 1992 should, therefore, facilitate the development of a comprehensive, basinwide plan for abating these CSOs in a cost-effective and environmentally beneficial manner.

Estimated costs for abatement of the Fall River CSOs are approximately $122 million. Abatement of the Providence-Blackstone-Seekonk River CSOs is projected to exceed $325 million. A significant portion of the costs for construction of CSO abatement facilities is expected to be recovered from sewer use fees although some funding may be available through the State Revolving Funds, subject to other state priorities for wastewater treatment projects.

GOAL: ***The State of Rhode Island and the Commonwealth of Massachusetts, in conjunction with the federal government and the municipalities, should establish necessary interstate and interagency agreements to coordinate and oversee implementation of the Narragansett Bay Comprehensive Conservation and Management Plan.***

The following actions should be undertaken in order to assure coordinated implementation of the *CCMP* and to achieve measurable progress toward restoring and protecting Narragansett Bay:

ACTION: The U.S. Environmental Protection Agency (EPA), the State of Rhode Island, and the Commonwealth of Massachusetts should cooperate to establish a Narragansett Bay Implementation Committee, a Narragansett Bay Policy Committee, and a Narragansett Bay planning section to: (1) coordinate and oversee *CCMP* implementation, including negotiation of interagency agreements where necessary, (2) participate in *CCMP* implementation by drafting necessary legislation, regulations, and policies, and by participating as commenters in federal consistency reviews, (3) supervise and review the results of the long-term monitoring program, and (4) revise the *CCMP*, as necessary, based on new scientific, policy, and/or economic information.

Completion of the *CCMP* signals the beginning of the implementation process. The ability of the federal, state, and local authorities in the Narragansett Bay basin to implement the *CCMP* obviously depends upon available funding. However, implementation of the *CCMP* also depends upon coordinated interstate and interagency action, public support, and the ability to continuously upgrade and refine *CCMP* recommendations, priorities, and implementation schedules. Therefore, the imple-

menting authorities should continue to work together to coordinate their actions, solicit public comment, evaluate progress, and revise the *CCMP* based upon new scientific, policy, and economic information.

The Narragansett Bay Implementation Committee, modeled after the Narragansett Bay Project Executive Committee, should be responsible for coordinating agency action. The Narragansett Bay Policy Committee, modeled after the Narragansett Bay Project Management Committee, should provide a permanent forum for the public to comment on policy matters related to the health and governance of Narragansett Bay. A Narragansett Bay planning section should be established within RIDEM to provide staff support to *CCMP* implementing authorities; oversee the long-term monitoring program; and assist with *CCMP* implementation.

The recommended oversight committees are expected to be volunteer boards that meet routinely to review progress to date. Some external funding may be available from the EPA to oversee *CCMP* implementation. These funds, in conjunction with appropriate state funds, should be sufficient to support basic staff activities on behalf of the Narragansett Bay *CCMP*.

ACTION: The U.S. Environmental Protection Agency (EPA), the State of Rhode Island, the Commonwealth of Massachusetts, and other federal, state, and local authorities should cooperate in the execution of a long-term monitoring program for Narragansett Bay in order to measure the effectiveness of actions taken pursuant to the *CCMP* and to evaluate trends in the status and health of Narragansett Bay.

Section 320 of the federal Clean Water Act requires participants in the National Estuary Program to evaluate the effectiveness of actions taken pursuant to the *CCMP* and to report biennially to Congress on the status and health of the estuary. The long-term monitoring plan for Narragansett Bay builds on baseline physical, chemical, biological, and physiographic information collected by the NBP and others since 1985. The monitoring plan will enable regulators, planners, and scientists to evaluate the success of pollution control and source reduction measures, CSO abatement, and living resource management efforts, as well as to evaluate changes in the health of Narragansett Bay and its living resources.

Since over 40 separate monitoring programs administered by different federal, state, and local agencies are presently collecting information relevant to the management of Narragansett Bay, the State of Rhode Island should also make a concerted effort to establish and maintain a centralized natural resources database to archive this information. A centralized repository of natural resources data, linked to the existing Narragansett Bay Data System (NBDS) and the Rhode Island Geographic Information System (RIGIS), will enable resource managers to more effectively identify natural resource problems and trends.

The success of the long-term monitoring program in future years will depend upon coordinating the activities of all agencies that support monitoring programs, and also upon additional federal and state funding. The nucleus of a statewide natural resources database presently exists in the form of the NBDS and the RIGIS. However, an additional and continuing source of funds will be required to maintain the databases for the use of all state and local resource management agencies. Discussions are presently under way with regard to affiliating the NBDS with the University of Rhode Island's Coastal Institute.

SUMMARY

The high priority implementation actions, which are described more completely in the body of the *CCMP*, represent only a subset of all the pollution abatement and resource protection initiatives recommended in the Plan. (See Table II and Table 715-06(1) .) Although the Narragansett Bay *CCMP* borrows and descends from a long line of basin planning efforts in the State of Rhode Island, this Plan proposes many sweeping changes in the way government and the public address environmental protection. Most of the recommended actions anticipate and promote changes in the way citizens of Rhode Island and Massachusetts use raw materials and dispose of waste—the *CCMP* consistently stresses reduction in the use of polluting substances as the most cost-effective means to protect the integrity of the Bay ecosystem. Most of the recommended actions acknowledge that Narragansett Bay and the Bay basin will experience surges in growth over the next few decades—the *CCMP* consistently stresses the need to manage the impacts of the rate and distribution of growth as the only hope for protecting Narragansett Bay and avoiding costly remedial efforts in the future. Most importantly, all of the recommended actions consider Narragansett Bay within the context of its watershed and within the context of its changing demographics and use—the *CCMP* stresses that protection of Narragansett Bay cannot be separated from protection of its watershed. Finally, the *CCMP* also attempts to nurture the sense of stewardship that many Rhode Islanders already feel for the Bay. Therefore, the *Comprehensive Conservation and Management Plan* represents a view shared by many citizens of the Narragansett Bay basin: The protection and restoration of Narragansett Bay are realistically within the grasp of the Bay's managers, its trustees, *and most importantly*, its beneficiaries.

The Narragansett Bay Project Management Committee met on July 27, 1992, and recommended that the *CCMP* be transmitted to the Narragansett Bay Project Executive Committee for final approval. The Executive Committee met on August 4, 1992, and voted (three in favor and one abstention) to send the *CCMP* to the Governor of Rhode Island and the Administrator of the U.S. EPA for their signatures.

Providence, Rhode Island

15 August 1992

Mr. Ronald Manfredonia, Chair
NBP Executive Committee

The Narragansett Bay Project Executive Committee:

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Mr. Ronald Manfredonia, Chief
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Mr. George L. Sisson, Jr., Acting Chair
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TABLE I. SUMMARY OF BAY PROBLEMS, RANKED, BY REGION

BAY-WIDE			
PROBLEM(S)	**CAUSE(S)**	**SOURCE(S)**	**RISKS**
1. Loss of major fisheries	1. Overfishing	1. Efficiency of harvesting techniques, and level of effort 2. Lack of adequate information, and resource management structure	Failure to intervene will perpetuate the cycle of collapsing commercial fisheries, and resulting economic hardship.
	2. Habitat loss	1. Lack of adequate land use controls to protect critical habitats from effects of population growth and development 2. Habitat degradation due to point and nonpoint pollutant inputs	Failure to intervene will result in incremental loss of critical habitats, habitat degradation, eventual loss of biological diversity, and increased limitations on human use and enjoyment of natural resources.
2. Limitations on water quality-dependent uses	1. Fecal contamination	1. Human sewage from WWTFs 2. Human sewage from CSOs 3. Human sewage from OSDSs, storm drains, boater discharges	Failure to more effectively disinfect WWTF discharges and abate CSO discharges will permanently limit shellfish harvesting in urban areas. Failure to abate nonpoint pollution sources will result in increased closures of harvesting areas in suburbanizing regions.
	2. Toxics contamination	1. Industrial discharges and emissions 2. Residential, commercial discharges, motor vehicle emissions and runoff 3. Accidental chemical spills	Failure to reduce use and disposal of toxic pollutants will result in long-term public health risk to seafood consumers, incremental environmental degradation, and damage to aquatic organisms.

TABLE I. SUMMARY OF BAY PROBLEMS, RANKED, BY REGION

SUBURBANIZING AND UNDEVELOPED AREAS *e.g.*, **PARTS OF THE SAKONNET RIVER**			
PROBLEM(S)	**CAUSE(S)**	**SOURCE(S)**	**RISKS**
1. Trend toward habitat degradation and loss	Lack of adequate land use and development density controls to protect critical habitats and water quality	Rate and pattern of population growth and development	Failure to more effectively regulate land use and the density of development will result in incremental loss of critical habitats for aquatic plants and animals, and incremental degradation of water quality.

SUBURBAN AND URBANIZING AREAS *e.g.*, **GREENWICH BAY, NEWPORT HARBOR**			
PROBLEM(S)	**CAUSE(S)**	**SOURCE(S)**	**RISKS**
1. Trend toward limitation on water quality-dependent uses	Fecal contamination	Human sewage from WWTFs, OSDSs, storm drains, boater discharges	Failure to abate or more effectively treat existing sources of fecal contamination, and failure to limit density of future development dependent on septic systems will result in increased closures of shellfish harvesting areas, and other limitations on water quality-dependent uses.

TABLE I. SUMMARY OF BAY PROBLEMS, RANKED, BY REGION

2. Pockets of contaminated sediments	Toxics contamination and excess organic loadings	Historic and current discharges of toxic pollutants and domestic wastes from local industrial, commercial and residential sources	Failure to reduce use and disposal of toxic pollutants will result in further environmental degradation, may increase the long-term health risk to seafood consumers, and will limit future dredging and dredged material disposal options.
3. Habitat degradation and loss	Lack of adequate land use and development density controls to protect critical habitats	Rate and pattern of population growth and development	Failure to protect remnant critical habitats will result in incremental loss of critical habitats for aquatic plants and animals, incremental degradation of water quality, and eventual loss of biological diversity.

MOUNT HOPE BAY

PROBLEM(S)	CAUSE(S)	SOURCE(S)	RISKS
1. Limitations on water quality-dependent uses	1. Fecal contamination	1. Combined sewer overflows - Fall River	Failure to abate Fall River CSOs will result in permanent closure of 6,820 acres in Mount Hope Bay and parts of the Kickemuit River to commercial quahog, oyster, mussel fisheries.

TABLE I. SUMMARY OF BAY PROBLEMS, RANKED, BY REGION

PROVIDENCE-SEEKONK RIVER

PROBLEM(S)	CAUSE(S)	SOURCE(S)	RISKS
1. Limitations on water quality-dependent uses. (Also applies to segments of the Blackstone, Pawtuxet, Woonasquatucket, Moshassuck and Ten Mile Rivers.)	1. Fecal contamination	1. Human sewage from WWTFs 2. Human sewage from CSOs	Failure to more effectively disinfect WWTF discharges will result in continued closure of 5,430 acres to shellfish harvesting and swimming. Failure to abate CSOs will result in continued (intermittent) closure of 9,853 acres to shellfish harvesting.
2. Exceedance of Federal and state water quality standards intended to protect aquatic life and public health. (Also applies to segments of the Blackstone, Pawtuxet, Woonasquatucket, Moshassuck and Ten Mile Rivers.)	1. Toxics contamination, and excess nutrient inputs	1. Industrial, residential, commercial discharges through WWTFs and runoff (toxics) 2. Human sewage from WWTFs (nutrients)	Failure to reduce use and disposal of toxic pollutants will result in long-term health risk to seafood consumers, and further environmental degradation. Failure to reduce excess nutrient inputs could result in algal blooms, prolonged episodes of low oxygen, and/or fish kills.
3. Contaminated sediments. (Also applies to segments of the Blackstone, Pawtuxet, Woonasquatucket, Moshassuck and Ten Mile Rivers.)	1. Toxics contamination	1. Historic and current discharges of toxic pollutants and domestic wastes from sources in the Providence River basin, including the Blackstone and Pawtuxet Rivers	Failure to reduce use and disposal of toxic pollutants will result in further environmental degradation and long-term public health risk to seafood consumers, and will limit future dredging and dredged material disposal options.

TABLE II. HIGHEST PRIORITY ACTIONS FOR IMMEDIATE IMPLEMENTATION

Recommended Action	Implementing Authorities	Goal no.					Cost by Year		Implementation Status
		1	2	3	4	5	92-93	93-94	
Adopt legislation requiring municipalities to establish wastewater management districts and amend existing regulations governing siting, design, construction, and maintenance of on-site sewage disposal systems.	RIDEM, MADEP, CRMC, RIDOP, municipalities or utilities, *e.g.*, WWTFs	X					95,000	0	Estimated cost is for dev'pt of OSDS regulations. Estimated first year cost to establish WWMD is $150,000, recoverable from user fees. [See RIDEM's "Preliminary Agreement".]
Implement a marina pump-out facility siting plan for Narragansett Bay that includes a consistent written policy for (1) regulating the construction of marinas, docks, and mooring fields; and (2) enforcing prohibitions against boater discharges in Narragansett Bay.	RIDEM, CRMC, municipal and private boating facilities	X					45,000	0	Cost estimate includes RIDEM-CRMC coordination efforts. Estimated cost of installing pump-outs ($11,500) is not included. [See EPA and RIDEM "Preliminary Agreements".]
Develop guidance for municipal officials regarding (1) "best management practices" to control nonpoint source pollution, (2) innovative, environmentally protective land management and growth management practices, and (3) development of local and regional stormwater management plans to reduce or treat storm runoff.	RIDEM, MADEP, CRMC, MACZM, RIDOP, EPA, USDA, NOAA, RI and MA Cooperative Extensions	X					111,000	111,000	Some funding may be available from EPA, NOAA, and USDA through CWA Section 319, CZMA Section 6217, and USDA SCS nonpoint source control initiatives. [See EPA, USDA SCS, RIDEM and RIDOP "Preliminary Agreements."]
Develop statewide *Critical Resource Protection Policies* that include (1) objective criteria for designating critical resources and critical resource protection areas, (2) a Geographic Information System-based mapped inventory of identified resources, and (3) regulatory and non-regulatory controls for protecting identified critical resources.	RIDEM, MADEP, CRMC, MACZM, RIDOP, municipalities		X				180,000	105,000	Some external federal funding may be available in 92-93 to initiate policy development. [See RIDEM and RIDOP "Preliminary Agreements".]

See 715-05-06 "Preliminary Agreements to Implement the Approved Narragansett Bay *CCMP*.

TABLE II. HIGHEST PRIORITY ACTIONS FOR IMMEDIATE IMPLEMENTATION

Recommended Action	Implementing Authorities	Goal no.					Cost by Year		Implementation Status
		1	2	3	4	5	92-93	93-94	
Prepare a Special Area Management (SAM) Plan for Greenwich Bay.	CRMC, RIDEM, RIDOP, munic.		X				150,000	100,000	$150,000 may be available for preliminary Greenwich Bay Plan. [See RIDEM-CRMC-NBP Interagency MOA (1991).]
Develop species-specific management plans for managing (1) commercially, recreationally, and ecologically important fish and shellfish; (2) all threatened and endangered estuarine-dependent plants and animals; and (3) the re-introduction of native anadromous and catadromous fisheries to Bay tributaries, wherever possible.	NOAA, USFWS, RIDEM, MADFW			X			N/A	N/A	No cost estimate prepared. Quahog Management Plan is highest priority. [See RIDEM "Preliminary Agreement", pending availability of funding.]
(1) Revise existing municipal and industrial discharge permits to include enforceable, numeric, and chemical-specific limits for all toxic chemicals listed on the Narragansett Bay "List of Toxics of Concern," (2) enforce compliance with these revised discharge limits, and (3) include other significant non-industrial sources of toxic chemicals in these regulatory programs in order to meet state water quality goals for state waters.	EPA, RIDEM, MADEP, WWTFs				X		50,000	62,500	Costs estimated only for state permitting and enforcement efforts. WWTF costs are recoverable from user fees, and are not presented. [See EPA and RIDEM "Preliminary Agreements".]
Continue efforts to abate the combined sewer overflows (CSOs) in Mount Hope Bay and the Providence and Blackstone Rivers in accordance with a statewide CSO abatement priority ranking system.	EPA, RIDEM, MADEP, NBC, City of Fall River				X		15,192,500	19,732,000	Primarily planning and design costs. Major capital construction costs begin in 94-95. [See EPA and RIDEM "Preliminary Agreements".]

See 715-05-06 "Preliminary Agreements to Implement the Approved Narragansett Bay *CCMP*.

TABLE III. SUMMARY OF ESTIMATED CCMP COSTS

COST ESTIMATES BY SUBJECT	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
Source Reduction: Toxics	1,532,500	755,000	720,000	755,000	918,500	1,801,000	853,500	1,116,000	853,500	1,116,000	4,878,000	5,543,000
Source Reduction: Nutrients	2,500	150,000	29,375	0	30,625	400,000	54,375	0	29,375	0	146,250	550,000
Source Control: Water Management and Wastewater Treatment	20,000	0	20,000	0	46,250	0	45,000	0	20,000	0	151,250	0
Source Control: Combined Sewer Overflows	102,500	15,090,000	60,000	19,672,000	82,500	103,481,000	65,000	116,462,000	70,000	86,222,250	380,000	340,927,250
Source Control: On-Site Sewage Disposal Systems	138,750	5,000,000	5,000	0	130,000	0	85,000	0	92,500	0	451,250	5,000,000
Source Control: Boater Discharges	210,000	107,250	10,000	6,000	57,500	6,180	20,000	6,000	20,000	6,000	317,500	131,430
Source Reduction: Nonpoint Sources	828,750	12,000	400,000	12,000	880,750	97,000	3,172,000	97,000	3,072,000	97,000	8,353,500	315,000
Land Use	257,500	12,000	167,500	12,000	437,500	12,000	330,000	12,000	305,000	12,000	1,497,500	60,000
Protection of Critical Areas	315,000	334,000	165,000	417,000	211,250	250,000	145,000	167,000	145,000	167,000	981,250	1,335,000
Public Health	384,000	354,550	281,500	340,000	521,500	355,000	456,500	340,000	471,500	340,000	2,115,000	1,729,550
Mount Hope Bay	182,500	50,000	15,000	50,000	37,500	250,000	15,000	0	15,000	0	265,000	350,000
Blackstone River	360,625	134,750	110,625	20,750	355,000	12,140,000	125,000	12,000	125,000	12,000	1,076,250	12,319,500
CCMP Implementation and Governance	448,750	265,000	390,000	265,000	400,000	265,000	400,000	265,000	400,000	265,000	2,038,750	1,325,000
TOTALS	4,783,375	22,264,550	2,374,000	21,549,750	4,108,875	119,057,180	5,766,375	118,477,000	5,618,875	88,237,250	22,651,500	369,585,730
TOTAL BY YEAR		**27,047,925**		**23,923,750**		**123,166,055**		**124,243,375**		**93,856,125**		**392,237,230**

TABLE II. HIGHEST PRIORITY ACTIONS FOR IMMEDIATE IMPLEMENTATION

Recommended Action	Implementing Authorities	Goal no.					Cost by Year		Implementation Status
		1	2	3	4	5	92-93	93-94	
Establish a Narragansett Bay Implementation Committee, a Narragansett Bay Policy Committee, and a Narragansett Bay planning section to oversee *CCMP* implementation.	NBP Executive Committee, NBP Management Committee					X	270,000	270,000	Some external federal funding available in 92-93 and 93-94 to begin implementation. [See EPA, RIDEM, RIDOP "Preliminary Agreements".]
Implement a long-term monitoring program for Narragansett Bay	RIDEM, MADEP, EPA, NOAA, RIDOH, MADPH					X	250,000	250,000	Coordination of on-going programs will offset projected cost. [See EPA ERLN's "Preliminary Agreement".]
Total cost							**16,343,500**	**20,630,500**	

See 715-05-06 "Preliminary Agreements to Implement the Approved Narragansett Bay *CCMP*.